

UK / GERMANY
FACTORY PERFORMANCE COMPARISON

Cranfield School of Management Report, 1997.

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1.0 Introduction

The Management Today Best Factory Awards in association with Cranfield School of Management have been successfully running in the UK in their current format since 1992. The purpose of the awards is to recognize and reward manufacturing excellence in the UK. Previous winners of the coveted 'Factory of the Year' award include Bonas Machine Company in 1995 and Van den Bergh Purfleet Foods factory in 1996. However, in addition to recognising manufacturing excellence, the programme collects detailed benchmarking data on manufacturing performance from over two hundred companies each year. This has enabled an extensive database to be created, against which individual manufacturing plants can be judged. In addition the database is being for research purposes investigating manufacturing performance in various industrial sectors.

The Best Factory Awards programme is being extended to other countries to enable international comparisons to be made. The awards were launched in Germany in 1996, in conjunction with the Export-Akademie of Baden Württemberg and led by Professor Dr. Pfeiffer. Due to the use of an identical method for collecting data in Germany and the UK, it is possible to make meaningful international comparisons. This research paper presents the first results of comparing manufacturing performance between the two countries.

2.0 Best Factory Awards in Germany and the UK

The Best Factory Awards are run on a national basis, with essentially identical programmes running in parallel in the two countries. In Germany, the programme is called the BFA Deutschland [BFA (D)].

In each country the awards are open to any manufacturing plant; a plant being defined as a relatively self-contained unit with its own management staff and either separate facilities or separate products. To enter the awards, a plant needs to complete a detailed 14 page questionnaire which includes descriptive data (e.g. plant size, cost structure); management policy data (e.g. market positioning); and performance data (delivery reliability, quality

etc.). The questionnaire collects mainly quantitative data – hard numbers rather than qualitative data (e.g. the actual level of absenteeism rather than its perceived level on a scale of 1 to 5). In Germany, a translated but otherwise identical version of the questionnaire is used, and this enables direct comparisons to be made.

Each plant that enters the programme receives back a detailed benchmarking report that compares the plant's performance against the other plants in the same industry sector. The benchmarking report contains more than 80 data tables and is used by companies to identify which areas of their manufacturing performance need improvement – this report is favorably viewed by companies and acts as a motivating factor for them to enter the awards programme.

Companies with multiple plants can enter more than one of their plants for the awards, in which case each is treated as a separate entity. There are several categories of awards including industry sector awards, a small business award and the coveted Best Factory of the Year Award overall prize.

The programme is supported in Germany by Deutsche Bank, Impulse, Management Partner, Datapec and ASU/BJU Bundesverband (entrepreneurs' and young entrepreneurs' associations). In the UK, the management magazine *Management Today* is the partner of Cranfield School of Management.

3.0 Data

As the UK Best Factory Awards have been running since 1992, over this time, more than 1000 manufacturing plants from a wide spectrum of industry sectors have taken part. For instance, in 1996 227 plants entered. In Germany, the programme was started as a pilot in the state of Baden-Württemberg in 1996, and 25 plants completed the questionnaire. Due to this relatively low number of German companies, the comparison between plants could not be undertaken for all the industry sectors and this study focuses on one industry sector – engineering.

The 15 German plants in the engineering sector were matched with similar UK plants taken from the UK Best Factory Database for the period 1994-96. The process of matching involved taking the UK samples and drawing out those plants that matched the

German plants. The two groups of plants were matched on a number of criteria to ensure that the final comparison was carried out for two similar groups.

A comparable sample of UK plants was selected to match the German plants based on the following five criteria:

1. Factory size (square meters)
2. Product complexity
3. Product type
4. Number of employees
5. Mix of make-to-order and make-for-stock production.

Based on these five criteria, 15 comparable plants were selected from the UK Best Factory Awards database. The UK plants were closely matched with the German plants, so that for example, where a German plant manufactured complex products and was producing to customer order, the UK plant also manufactured a similar complex product and was also manufacturing to order. We also ensured that both the size of the factory and the number of people employed was similar. As a result, the performance of the 15 German plants can realistically be compared with the performance of the 15 UK plants.

The sample of German Engineering plants was not dominated by any particular sub-sector. Some of the plants came from the automotive sector, another group of plants came from the mechanical engineering sector. Also, there was a fair mix of plants in terms of some making mainly for stock and another group of plants mainly manufacturing to customer order.

The plants were compared on 14 key performance measures. The majority of the measures are widely known, and the performance of UK manufacturing plants has been published by Management Today and Cranfield School of Management in “The Making of Britain’s Best Factories”. The 14 key performance measures are shown in Table I.

Table 1: Key Performance Measures

1. Average changeover times in component/intermediate manufacture
2. Average changeover times in assembly and packing
3. Stock-turns per year
4. Average rate of absenteeism
5. Time to bring a product innovation to market
6. Current innovation rate
7. Planned (future) innovation rate
8. Ex-stock availability
9. Due-date reliability
10. Scrap or yield loss rate
11. Percentage capacity used for rework/reprocessing
12. Percentage capacity used for setting/changeovers
13. Customer returns (or complaints)
14. First time pass rate at final test

4.0 Results of the comparison

Table 2 shows a comparison of the average performance of the two groups for various factory related performance measures.

Performance Measures	Unit	Average Germany	Average UK	Significant difference ⁺ at the 5% level?
Stock-turns per year	Turns	2.71	9.36	Yes
Average rate of absenteeism	%	5.89	3.33	Yes
Ex-stock availability	%	81.97	94.14	Yes
Average changeover times in component/intermediate manufacture	Mins	82.42	54.85	No
Average changeover times in assembly and packing	Mins	36.91	25.00	No
Scrap or yield loss rate	%	2.50	2.01	No
Percentage capacity used for setting/changeovers	%	6.33	5.74	No
Customer returns (or complaints)	%	0.68	0.52	No
Time to bring a product innovation to market	Months	14.03	17.71	No
Current innovation rate	%	11.29	9.77	No
Planned (future) innovation rate	%	13.54	10.76	No
Due-date reliability	%	90.41	87.32	No
First time pass rate at final test	%	98.87	98.09	No

Table 2. German and UK plants - comparison of the results.

The comparison presented in Table 2 shows the mean performance levels in the UK and Germany are generally similar but with a tendency for the UK plants to be better in a number of important areas. Significant differences in performance exist for stock-turns, absenteeism levels and the level of ex-stock availability.

⁺ T-test

The German plants turned their stock over only 2.71 times per year, while the UK plants turn their stock over 3 times more often at 9.36 times per year. The German plants suffer an average absenteeism rate of 5.89%, while the UK average was almost half of this figure at 3.33%. For ex-stock availability, German plants have a lower level of performance than the UK plants, the difference being around 12.17 percentage points.

The UK manufacturing plant is able to offer a higher level of service in terms of off the shelf supply than a comparable German plant.

When we examine set-up times we find that UK plants have shorter set-up times than the German plants, both in component and the assembly stage of manufacturing. However the results of the difference between the means for set-up times is not significant.

German industry is renowned for its quality and is supposed to excel at innovation and we find that the German plants are in fact somewhat faster than the UK manufacturing plants in bringing new products to market. On average, German companies need only around 14 months to introduce new products, compared to the 17.71 months required by the UK plants. The German current innovation rate (the rate of new product introduction over the last five years) is about 1.52 percentage points higher when compared with the UK innovation rate. The planned innovation rate (the rate of new product introduction over the next five years) for German plants is 2.78 percentage points higher than the UK plants planned innovation rate. However although the differences in the means are dramatic, they are not significant.

Although the UK manufacturing plants have a higher level of ex-stock availability we can see from Table 2 that the German plants have a higher level of delivery performance. However interestingly enough the two groups of plants have a fairly similar level of quality, when the figures for the first time pass rate at final test are compared. Table 2 indicates that German factories use more of their capacity for changeovers than the UK plants, the same can be said for re-work.

5.0 Conclusions

It would appear that the 15 UK engineering plants are better in a number of key areas than the German plants. The UK factories had a significantly higher level of stockturns, lower level of absenteeism and higher ex-stock availability. But how reliable are these figures and how accurate a picture do they paint? Although the Management Today Best Factory Awards in association with Cranfield School of Management have been running in the UK since 1992, the German awards only started in 1996. The small sample of German companies on which data is available restricted the number of matched pairs that could be constructed. This in turn impacted on the level of statistical significance that could be attached to the observed UK-German differences: broadly speaking, the more plants in the sample the more reliable and statistically significant the results will be. However, even the result from this small sample are important since a comparison was made of two sets of broadly identical engineering plants. As more plants enter the German awards, a clearer picture should emerge of the differences and similarities in manufacturing performance between the two countries.

In the past there has been much rhetoric in the press about the relative performance of manufacturing industry in different European countries. Much of this discussion has been based on flawed studies or anecdotal evidence of national differences. In contrast the Best Factory Awards Programme aims to collect accurate, objective data which can be used to make meaningful comparisons of manufacturing performance between Germany and the UK. By taking the level of discussion from the rhetorical to a reliable basis, the Best Factory Awards aims to make comparisons that identify best practices in manufacturing performance. It is likely that managers in both the UK and Germany will be able to draw some useful conclusions from these comparisons.